

way to contradict well-known authors on a matter of fact. We refer to the inclusion of the Altai wapiti (*Cervus eustephanus* of Blanford) as a synonym of the Persian red deer (*C. maral*). A greater blunder could hardly have been committed.

Neither is the work quite free from misprints, as witness *Rucercus* for *Rucervus*, on page 875.

Nevertheless, as already said, the blemishes and faults are but few, while good work is pre-eminently conspicuous; and we therefore close this brief notice with a repetition of the sense of the obligation under which Dr. Trouessart has placed all working students of the Mammalia.

R. L.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

November 9th, 1898.—W. Whitaker, B.A., F.R.S.,
President, in the Chair.

The following communication was read:—

‘On the Palæozoic Radiolarian Rocks of New South Wales.’
By Prof. T. W. Edgeworth David, B.A., F.G.S., and E. F. Pittman,
Esq., Assoc.R.S.M., Government Geologist, New South Wales.

The first evidence of the presence of radiolaria in the rocks of New South Wales was obtained by Prof. David in 1895, as the result of a microscopic examination of some red jaspers from different areas. Further research by the same author was stimulated and guided by seeing the radiolarian rocks recently discovered in Mullion Island, Cornwall, and in the Culm-districts of Devonshire, during a visit to England in 1896; and on his return to Sydney he recognized the existence of a series of cherts, lydites, and siliceous limestones containing radiolaria in four distinct areas. A brief preliminary account of these rocks was communicated to the Linnean Society of New South Wales, and specimens were forwarded to Dr. G. J. Hinde for determination of the radiolaria. Subsequently, in conjunction with Mr. Pittman, a detailed examination of the rocks in the field was carried out, and the results are given in the present paper. In this final investigation it was ascertained that not only in the cherts and siliceous limestones, but also in the jointed claystones which form the prevalent sedimentary rocks of the Tamworth district, radiolaria were distributed in vast numbers.

The three chief areas of radiolarian rocks in New South Wales are Bingara, Barraba, and Tamworth, situated in the New England District, between 180 and 270 miles north of Sydney. Bingara, the farthest locality, is 30 miles north of Barraba; and this latter is 60 miles north of Tamworth. The character of the rocks in these localities tends to show that they belong to the same series; and in this case its extension from south to north is about 85 miles.

The fourth area of radiolarian rocks is at the well-known Jenolan Caves, about 67 miles due west of Sydney and about 200 miles south-by-west of Tamworth. It is probable that the Jenolan rocks may be on a somewhat different, perhaps lower, horizon than those of the northern district.

At Bingara and Barraba the radiolarian rocks consist of red jaspers and fine-grained jointed claystones, accompanied by thick coral-limestones and numerous beds of interstratified tufaceous materials. The radiolaria occur as casts in chalcedony in the jaspers and claystones. The rocks dip at a high angle. No macroscopic fossils are known with certainty from these districts.

In the Jenolan Cave district the radiolarian rocks consist of black cherts and clay-shales overlying the Cave Coral Limestone, and of greenish-grey shales underlying this rock. The series is traversed by felsitic dykes, and the hardness of the cherts is attributed to silica derived from the acidic dykes, rather than to that derived from the tests of the siliceous organisms.

It is at Tamworth that the radiolarian rocks are developed on a grand scale; their measured thickness amounts to 9267 feet, after allowing for an immense fault, and neither upward nor downward limit is shown. The rocks consist of jointed claystones, black cherts, lenticular siliceous radiolarian limestones, and coral-limestones. Numerous beds of submarine tuff also occur. The claystones are largely formed of radiolaria. In certain beds of the claystones, and in some of the tuffs as well, impressions of *Lepidodendron australe* are not uncommon; and beds of radiolarian limestone occur in close proximity to the beds with these plant-remains, and radiolaria moreover abound even in the same rock with the *Lepidodendron*-impressions.

At the eastern end of the Tamworth section, and also near the westerly portion, there are limestones containing corals, which have been determined by Mr. R. Etheridge, jun. They are similar to those of the Burdekin Limestones of Queensland which belong to the Middle Devonian, and the radiolarian rocks are thus shown to belong to this period.

Analyses of the radiolarian chert, cherty shale, shale, and siliceous limestone prepared by Mr. J. C. H. Mingaye, F.C.S., are given; and from these it appears that, while the amount of silica in the chert and shale ranges between 68 and 91 per cent., there is only 18 per cent. in the siliceous limestone.

Descriptions of numerous micro-sections both of the sedimentary and of the tufaceous rocks are appended, and in their conclusions the Authors point to the remarkably fine-grained character of the materials forming the base of the radiolarian cherts, jaspers, and shales, the constituent particles not being more than 0.05-0.025 mm. ($\frac{1}{2000}$ to $\frac{1}{4000}$ inch) in diameter. They are of opinion that the radiolaria were deposited in clear sea-water, which, though sufficiently far from land to be beyond the reach of any but the finest sediment, was nevertheless probably not of very considerable depth.